The opinion in support of the decision being entered today was *not* written for publication and is *not* binding precedent of the Board.

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte CHAD A. COBBLEY, TONGBI JIANG, and ED A. SCHROCK

Appeal 2006-2823
Application 08/916,629
Technology Center 1700

Decided: February 8, 2007

Before CHARLES F. WARREN, THOMAS A. WALTZ, and CATHERINE Q. TIMM, *Administrative Patent Judges*.

WALTZ, *Administrative Patent Judge*.

DECISION ON APPEAL

This is a decision on an appeal from the Primary Examiner's final rejection of claims 1 through 22 and 40 through 44, which are all of the claims pending in this application. We have jurisdiction pursuant to 35 U.S.C. § 134.

According to Appellants, the invention is directed to a method of packaging a semiconductor die, including the steps of providing a leadframe

and a cyanoacrylate adhesive, applying a volume of this adhesive to the leadframe or the die, pressing together the die and the leadframe, and polymerizing from 90-100% of the adhesive material in less than about 60 seconds without heating the die and leadframe (Br. 7).[1] A copy of illustrative independent claim 1 is reproduced below:

1. A method for packaging a semiconductor die comprising:

providing a leadframe;

providing a cyanoacrylate adhesive material formulated to cure in less than about 60 seconds in a temperature of about 20°C to 30°C and an ambient atmosphere;

applying a volume of the adhesive material in viscous form to the leadframe or to the die;

pressing the die and the leadframe together to form an adhesive layer between the die and the leadframe; and

polymerizing from 90-100% of the adhesive material without heating the die and the leadframe in less than about 60 seconds.

The Examiner has relied upon the following references as evidence of obviousness, in addition to the admitted prior art (APA) found in Appellants' Specification and Amendment:

Tanabe (JP '280) (as translated)	JP 58-196280	Nov. 15, 1983
Krall	US 4,713,235	Dec. 15, 1987
Takahashi (DE '347) (as translated)	DE 41 07 347 A1	Sep. 12, 1991
Fogal	US 5,140,404	Aug. 18, 1992
Davis	US 5,214,307	May 25, 1993
Farnworth	US 5,218,229	Jun. 08, 1993
Liang	US 5,233,131	Aug. 03, 1993
Zwick (PCT '953)	WO 97/06953	Feb. 27, 1997

[1] We refer to and cite from the "Amended Appeal Brief" dated Jan. 30, 2006.

Zwick US 5,690,766 Nov. 25, 1997
Chorbadjiev, "The effect of fillers upon the properties of electroconductive cyanoacrylate adhesives," *Int. J. Adhesion and Adhesives,* Vol. 8, No. 3, July 1988, 143-146.
Loctite Product Description Sheet, Loctite 410, Oct. 1996, 2 pages.
Loctite Product Description Sheet, Loctite 416, Oct. 1998, 2 pages.

ISSUES ON APPEAL

Claims 1-20 and 42-44 stand rejected under 35 U.S.C. § 103(a) as unpatentable over Krall in view of Chorbadjiev, the admitted prior art (APA), either one of Loctite 410 or Loctite 416, either one of Zwick or PCT '953, and optionally the "state of the prior art" as exemplified by at least one of Liang, Fogal, Farnworth, Davis, and DE '347 (Answer 6-7).

Claims 21, 22, 40, and 41 stand rejected under 35 U.S.C. § 103(a) as unpatentable over the APA in view of either Zwick or PCT '953 and JP '280 (Answer 14).

Appellants contend that, although die attach systems and die attachers are known in the art, they have not been used with cyanoacrylate adhesives (Br. 11). Appellants also contend that no reference has been cited in which a cyanoacrylate adhesive is used in a semiconductor packaging method for attaching a die to a leadframe (Br. 14).

The Examiner contends that the applied prior art suggests the advantages of cyanoacrylate adhesives over the traditional epoxy adhesives in conventional attaching systems, with known cyanoacrylate adhesives having cure times of less than 60 seconds (Answer 8-9).

Accordingly, the dispositive issue in this appeal is as follows: would the applied prior art have suggested to one of ordinary skill in this art the use of cyanoacrylate adhesives that cure in less than about 60 seconds at room

temperature and pressure as a substitute for conventional epoxy adhesives in conventional attaching systems for attaching a die to a leadframe?

We determine that the Examiner has established a prima facie case of obviousness based on the reference evidence, which Appellants have not adequately rebutted by their arguments. Therefore we AFFIRM both grounds of rejection in this appeal essentially for the reasons stated in the Answer, as well as those reasons set forth below.

OPINION

We determine the following facts from the record in this appeal:

(1) Krall discloses that cyanoacrylates "have found wide use as adhesives for ... general purposes" and have the ability "to polymerize rapidly at room temperature in the absence of a solvent" (col. 1, ll. 11-16);

(2) Krall teaches that "in the manufacture of electronic microchips it has been suggested that MCA [methyl cyanoacrylate] may be a useful adhesive for joining contact leads to the chips" (col. 1, ll. 47-49; Answer 7);

(3) Chorbadjiev teaches that "[c]yanoacrylate conductive adhesives, when compared to the *traditional epoxy* and acrylic based conductive adhesives have the following strong points," such as short setting time at room temperature, one component adhesives, strong bonding action, good electroconductivity, and are easy to work with (p. 143, italics added, footnote omitted; Answer 7-8);

(4) Appellants have admitted that cyanoacrylate adhesives which cure in less than 60 seconds at room temperature and ambient atmosphere were known in the art (Answer 8), as further

evidenced by Loctite 410 and Loctite 4416, product description sheets describing known cyanoacrylate adhesives with cure times of less than 60 seconds (Answer 9);[2]

(5) Zwick is directed to conventional bonding of a die to the leadframe with an epoxy adhesive but teaches the desire to increase the speed of the bonding process (col. 1, ll. 49-51; col. 2, ll. 7-10);

(6) Both Farnworth and Fogal teach that the "current methods of attaching the die **10** to the paddle **12**" include epoxy adhesives or a glue, where the "glue is normally a quick set type adhesive which requires no later cure" (Farnworth, col. 1, l. 54-col. 2, l. 18; *see also* Fogal, col. 1, l. 51-col. 2, l. 16, and col. 4, ll. 66-68);

(7) Davis teaches that "[o]ne step of semiconductor manufacture that is not without problems is the die-lead frame attachment," and the die is normally bonded to the paddle "with epoxy or another viscous adhesive" (col. 1, ll. 31-32 and 41-44); and

(8) JP '280 teaches an electroconductive paste suitable for the connection of a chip with a substrate, where the paste includes an anaerobic adhesive; JP '280 further teaches the advantages of this type of quick-setting adhesive over conventional epoxy adhesives (pages 2-3; *see the* Answer 17).

The test for obviousness is whether the teachings of the prior art, *taken as a whole,* would have made obvious the claimed invention. *See In re Young,* 927 F.2d 588, 591, 18 USPQ2d 1089, 1091 (Fed. Cir. 1991); *In re Keller,* 642 F.2d 413, 425, 208 USPQ 871, 881 (CCPA 1981). Where the

[2] Appellants disclose that Loctite 410 and Loctite 416 are commercially available adhesives that are suitable cyanoacrylate adhesives for their invention (Specification 8: 6-25).

claimed subject matter has been rejected as obvious in view of a combination of prior art references, a proper analysis under § 103 requires consideration of at least two factors: (1) whether the prior art would have suggested to those of ordinary skill in the art that they should carry out the claimed process; and (2) whether the prior art would also have revealed that in so carrying out the process, those of ordinary skill would have a reasonable expectation of success. *See In re Vaeck,* 947 F.2d 488, 493, 20 USPQ2d 1438, 1442 (Fed. Cir. 1991).

Applying these principles of law to the above-noted facts in this record, we determine that the prior art, as a whole, suggested the desire in the art to increase the bonding speed over conventional epoxy adhesives used to bond the die with the leadframe. We also determine that the prior art recognized that other known adhesives could be used in place of epoxy if these adhesives were "quick-setting." We further determine that commercially available quick-setting cyanoacrylate adhesives were known in the art, including adhesives with cure times of less than 60 seconds at room temperature and ambient pressure. We determine that the advantages of quick-setting conductive cyanoacrylate adhesives over conventional epoxy adhesives were known to one of ordinary skill in this art, and one of ordinary skill in this art would have reasonably expected that such adhesives would be successful in adhering a die to a leadframe.

For the foregoing reasons and those expressed in the Answer, we determine that the Examiner has established a prima facie case of obviousness in view of the reference evidence. Based on the totality of the record, including due consideration of Appellants' arguments, we determine that the preponderance of evidence weighs most heavily in favor of

obviousness within the meaning of § 103(a). Therefore we affirm the rejection of claims 1-20 and 42-44 under § 103(a) over Krall in view of Chorbadjiev, the APA, Zwick or PCT '953, Loctite 410 or Loctite 416, optionally in view of the APA as exemplified by at least one of Liang, Fogal, Farnworth, Davis, or DE '347.

With regard to the separate rejection of claims 21, 22, 40, and 41 (Answer 14-17), we note that, in addition to the facts listed above, Appellants admit that "anaerobic adhesives are known to have quick cure times" (Br. 21). Appellants argue that there would be "no incentive" to combine the cited references, contending that the Examiner's "sped up productivity" rationale has no basis in the art (Br. 22).

It is well-established that before a conclusion of obviousness may be made based on a combination of references, there must have been a reason, suggestion, or motivation to lead an inventor to combine the teachings of those references. *See Pro-Mold and Tool Co. v. Great Lakes Plastics Inc.*, 75 F.3d 1568, 1573, 37 USPQ2d 1626, 1629 (Fed. Cir. 1996). Here we determine that JP '280 provides sufficient motivation to modify the APA (which used an epoxy adhesive), since JP '280 describes the advantages of using an anaerobic adhesive over the conventional epoxy adhesive (pages 2-3 of translation; *see also* Answer 17).

For the foregoing reasons and those stated in the Answer, we determine that the Examiner has established a prima facie case of obviousness in view of the reference evidence. Based on the totality of the record, including due consideration of Appellants' arguments, we determine that the preponderance of evidence weighs most heavily in favor of obviousness within the meaning of § 103(a). Therefore we affirm the

rejection of claims 21, 22, 40, and 41 under § 103(a) over the APA in view of PCT '953 or Zwick, further in view of JP '280.

SUMMARY

We have affirmed both grounds of rejection involved in this appeal. Accordingly, the decision of the Examiner is affirmed.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a)(1)(iv)(2007).

AFFIRMED

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